

**In the Claims:**

Cancel claim 5.

Add claims 21-24.

Amend claims 1, 9, 11, 17, and 19-20 as shown below in the entire set of pending claims. Underlines indicate insertions; ~~strikeouts~~ indicate deletions.

1. (Currently amended) A customer profiling apparatus for  
2 conducting customer telephone behavior pattern analysis on telephone call records  
3 including telephone call data, comprising:  
4 processing circuitry operative to process customer telephone call  
5 records;  
6 a data warehouse coupled with the processing circuitry and configured  
7 to store the processed customer telephone call records;  
8 an OnLine Analytical Processing (OLAP) based scalable profiling  
9 engine communicating with the data warehouse and operative to build and update  
10 customer behavior profiles by mining the customer telephone call records that flow  
11 into the data warehouse; and  
12 at least one computer program, performed by the profiling engine, and  
13 operative to define behavior profiles defined at least in part by probability  
14 distributions, using data from the telephone call records, as data cubes and derive  
15 similarity measures on patterns extracted from the behavior profiles;  
16 wherein the behavior profiles are provided as two input calling pattern  
17 cubes, C<sub>1</sub> and C<sub>2</sub>, and a similarity cube, C<sub>s</sub>, is an output of a comparison between C<sub>1</sub>  
18 and C<sub>2</sub>, wherein the similarity cube, C<sub>s</sub>, represents a pair of corresponding sub-cubes  
19 of C<sub>1</sub> and C<sub>2</sub>.  
1 2. (Previously cancelled)  
1 3. (Original) The apparatus of claim 1 wherein the profiling engine  
2 comprises a commercial data warehouse server and a multi-dimensional OLAP  
3 server.

1           4. (Original) The apparatus of claim 1 wherein the profiling engine  
2 implements multi-level, multi-dimensional pattern analysis and comparison.

1           5. (Cancelled)

1           6. (Original) The apparatus of claim 1 wherein similarity measures  
2 are defined and computed on the patterns extracted from the behavior profiles.

1           7. (Original) The apparatus of claim 1 wherein the computer  
2 program is further operative to compare the data cubes with similarity measures  
3 identifying fraud so as to extract fraud detection from the behavior profiles.

1           8. (Previously cancelled)

1           9. (Currently amended) The apparatus of claim 1 wherein the  
2 behavior profiles are analyzed against a personalized threshold to detect caller fraud.  
*arb  
8/28/03*

1           10. (Original) The apparatus of claim 1 wherein the customer  
2 records comprise customer call records, the profiling engine builds and updates  
3 customer calling behavior profiles by mining the customer call records, and the  
4 computer program derives similarity measures on patterns extracted from the call  
5 behavior profiles.

1           11. (Currently amended) A profiling apparatus, comprising:  
2           a data warehouse for storing customer records including telephone call  
3           data;  
4           a profiling engine configured to communicate with the data warehouse  
5           and operative to generate customer telephone calling behavior profiles from the  
6           customer records within the data warehouse, the profiling engine being configured to  
7           define customer telephone calling behavior profiles using probability distributions,  
8           and to compute the customer telephone calling behavior profiles using OLAP  
9           operations on multi-dimensional and multi-level data cubes, one multi-level data cube  
10          being a profile cube, another multi-level data cube being a profile-snapshot cube,

11 and yet another data cube being a profile cube formed by merging together the  
12 profile cube and the profile-snapshot cube; and

13 a computer application program implemented on the profiling engine  
14 and operative to represent behavior profiles as patterns, using the telephone call  
15 data, and derive similarity measures of the patterns usable to profile customer  
16 behavior and detect fraud by deriving calling pattern cubes from the profile cubes.

1 12-15. (Previously cancelled)

1 16. (Previously amended) The apparatus of claim 11 wherein the  
2 updated profile cube is stored within a profile table of the data warehouse such that  
3 subsequent customer profiling utilizes customer records from the data warehouse  
4 comprising the updated profile cube.

1 17. (Currently amended) A method for comparing customer  
2 behavior patterns, comprising:

3 providing call data in the form of call data records to a data warehouse;  
4 loading the call data records into a multidimensional database of an  
5 OLAP server;

6 maintaining profiles by staging data between the data warehouse and  
7 the OLAP multidimensional database;

8 generating a profile-snapshot cube accommodating multiple  
9 customers;  
10 in combination with generating the profile-snapshot cube, generating a  
11 profile cube for the same set of customers from the data warehouse;  
12 updating the profile cube by merging the profile cube with the profile-  
13 snapshot cube; and  
14 storing the updated profile cube in the data warehouse.

1 18. (Original) The method of claim 17 wherein the data warehouse  
2 comprises profile tables configured to store the profile cube.

1 19. (Currently amended) The method of claim 17 wherein the  
2 updated profile cube is subdivided into a plurality of individual calling pattern cubes,

*PL Cont'd*

3 each representative of individual customers, and further comprising comparing  
4 calling patterns that have been derived from customer calling behavior profiles.

1 20. (Currently amended) The method of claim 19 further  
2 comprising the step of performing at least one steps of reporting, analyzing, and  
3 visualizing of one of the calling pattern cubes for an individual customer.

1 21. (New) The method of claim 19 further comprising retrieving  
2 profile tables to generate the profile cubes, retrieving call data tables to create  
3 profile-snapshot cubes that have a same dimension of a profile cube to facilitate  
4 merging by addition, deriving individual customer-based calling pattern cubes from  
5 the profile cubes, analyzing individual calling patterns in multiple dimensions and  
6 multiple levels, and computing a similarity of calling patterns that belong to different  
7 customers or to a same customer over different profiling periods.

1 22. (New) The apparatus of claim 1 wherein a cell of C<sub>5</sub> is  
2 mapped into a pair of corresponding sub-cubes of C<sub>1</sub> and C<sub>2</sub>.

1 23. (New) The apparatus of claim 22 wherein the sub-cubes are  
2 each treated as a bag, and cell-wise comparison results are summarized based on  
3 bag overlap.

1 24. (New) The apparatus of claim 22 wherein the sub-cubes are  
2 each treated as a vector, and cell-wise comparison results are summarized based on  
3 vector distance.